

## IN THE CLAIMS

Please amend the claims as follows:

Claim 1-31 (Canceled).

Claim 32 (New): A method for performing automatic analyses and comparisons of patents and technical descriptions of engineering systems, based on classifying functions to associated subsystems and sub-functions and functional elements to associated physical components, organizing data in different forms according to scope of the analysis, the method comprising:

- (a) examining a text of a patent or technical description;
- (b) identifying system components described in the examined text;
- (c) classifying a role of the identified system components in terms of an assembly, a part, and a portion;
- (d) classifying the identified system components in a hierarchy in terms of detail/abstraction level;
- (e) recognizing all functional links and interactions existing between the identified system components of the examined text;
- (f) identifying all secondary products of the examined text; and
- (g) among the identified secondary products, identifying a main product of the examined text.

Claim 33 (New): A method according to Claim 32, wherein the (b) identifying the system components described in the examined text comprises:

- (b1) searching for numeric characters in a text;

(b2) for each numeric character, taking into account a range of preceding and following words, each range constituting a row of a matrix of candidate components;

(b3) filtering non component terms, deleting rows containing stop keywords for words adjacent to a numeric character, the stop keywords representing references to figures, patents or documents and measure units;

(b4) among those rows containing a same numeric character, recognizing synonyms and analog words;

(b5) identifying an intersection set of words belonging to the rows containing the same numeric character, such a set of words being assumed as a representative name of the component referenced by the numeric character of those row.

Claim 34 (New): A method according to Claim 32, wherein the (b) identifying the system components described in the examined text is performed with an assumption that the components interact as subjects and objects of a basic functional triad composed of: a Tool, a Field, and an Artifact, and the (b) identifying comprising:

(b1) extracting from each sentence a triad Tool-Field-Artifact TFA, from an XML document or by using a semantic processor;

(b2) filtering the triads TFA containing a list of verbs not significant from a functional point of view;

(b3) collecting Tools and the Artifacts that have survived the filtering;

(b4) optionally, adding a further set of candidate components by using commonly available techniques to identify words representative of a content of a text;

(b5) among all candidate components, the candidate components being Tools and Artifacts that survived the filtering phase, removing noun repetitions, also taking into account synonyms of candidate components.

Claim 35 (New): A method according to Claim 32, wherein a detail/abstraction comparison criteria is applied to classify system components according to:

- analyzing descriptive locutions and/or specification expressions;
- assigning to a component preceding a preposition a role of subsystem of a component following the same preposition;
- searching descriptive verbs taking into account all forms that these verbs can assume, also due to conjugation irregularities;
- assuming that components preceding a descriptive verb are subsystems/supersystems of components following the descriptive verb itself as a function of a meaning of such a verb;
- and
- performing the analyzing, assigning, searching, and assuming taking into account all alternative denominations of each component.

Claim 36 (New): A method according to Claim 32, wherein a Detail Level DL is assigned to each component, said DL representing a maximum abstraction level by a  $DL=O$ , each subsystem being one level greater than the DL of a corresponding supersystem.

Claim 37 (New): A method according to Claim 36, wherein for plural Detail Levels DL assigned to a same component, so that a maximum abstraction level is represented by a  $DL=O$  and the DL of each subsystem is one level greater than the DL of a corresponding supersystem, a hierarchy simplification is performed eliminating all hierarchical jumps.

Claim 38 (New): A method according to Claim 36, wherein for a same Detail Level DL assigned to a same component so that a maximum abstraction level is represented by a

DL=O and the DL of each subsystem is one level greater than the DL of a corresponding supersystem, a parallel hierarchy identification occurs taking into account such parallel hierarchies.

Claim 39 (New): A method according to Claim 32, further comprising (i) processing all components to identify a role of a component in an assembly described in a text according to:

- (i1) assigning an attribute portion to all components whose name contains words describing a portion of a component;
- (i2) assigning an attribute assembly to all components having at least one subsystem that in the (i1) assigning has not been labelled as portion;
- (i3) assigning an attribute part to all components not labelled in the (i1) assigning and (i2) assigning.

Claim 40 (New): A method according to Claim 32, further comprising (i) identifying functional links existing between recognized components of the examined text according to:

- (i1) searching for sequences of words containing names of two system components separated by a verb, excluding a triad component-verb-component so that the verb is not significant from a functional point of view;
- (i2) assuming components that precede and follow the verb as the Tool and the Artifact of the triad, as a function of a meaning and of an active/passive form of the verb itself;
- (i3) searching for sequences of words containing at least one system component and a verb of the functionalities requested in a given field of application, these being significant verbs from a functional point of view;

(i4) assuming the component, referred to in the (i3) searching, as the component of the triad, as the function of the meaning and of the active/passive form of the verb itself.

Claim 41 (New): A method according to Claim 40, wherein an external system is identified, the external system being a Tool or an Artifact of a functional triad, so that it has not been recognized.

Claim 42 (New): A method according to Claim 40, wherein a functional link is identified, so that the Tool is a component of the system and the pair Field-Artifact can be translated into a function, a search for the Artifact of such a function can be demanded to a user or performed by looking for a first identified component following a preposition typically associated to that pair Field-Artifact.

Claim 43 (New): A method according to Claim 32, wherein the (f) identifying all secondary products of the examined system comprises:

(f1) each Artifact is assumed as a secondary product of the examined system;

(f2) a secondary product loses this property, thereby becoming a standard component of the system, in following cases:

in the detail level hierarchy a candidate secondary product has at least two abstraction levels above so that its Detail Level DL is greater than or equal to 2;

a number of functional interactions is such that a candidate secondary product is a Tool that is greater than or equal to the number of functional interactions so that it is an Artifact.

Claim 44 (New): A method according to Claim 32, wherein the main product of the examined system is identified, among all identified secondary products, as one with a maximum ratio between a number of interactions so that the secondary product is an Artifact and a number of interactions so that the secondary product is a Tool.

Claim 45 (New): A method according to Claim 32, wherein the main product of the examined system is identified among all identified secondary products, as one whose sum of following different probability values is maximum:

- checking if a secondary product is mentioned as an Artifact in a first two claims of the patent;

- checking if a secondary product is mentioned as an Artifact in an abstract of the patent;

- checking if a secondary product is mentioned as an Artifact in a title of the patent;

- evaluating how many times the secondary products are mentioned in the whole patent and normalizing these values with respect to the maximum frequency; the normalized value multiplied by 100 is assumed as a partial probability value, but in any cases it must be lower than or equal to a predefined value;

- checking if a secondary product is an Artifact of a Field present as a Field in the first two claims of the patent;

- checking if a secondary product is an Artifact of a Field present as a Field in the abstract of the patent;

- checking if a secondary product is an Artifact of a Field present as a Field in the title of the patent;

- evaluating how many times the Fields acting on the secondary product, considered as an Artifact, are mentioned in the whole patent and normalizing these values with respect to

the maximum frequency, this normalized value multiplied by 100 is assumed as the partial probability value, but in any cases it must be lower than or equal to a predefined value;

evaluating how many times the pairs Field-Artifact, so that the Artifact is a secondary product, are mentioned in the whole patent and normalizing these values with respect to the maximum frequency, this normalized value multiplied by 100 is assumed as the partial probability value, but in any cases it must be lower than or equal to a predefined value.

Claim 46 (New): A system for performing automatic analyses and comparisons of patents and technical descriptions of engineering systems according to the method of Claim 32, the system comprising:

- a Temporary Storage Database in which a text to be analyzed, entered by a user, is stored;

- a Database of Stop Words and Analog Words;

- a Text Analyser Module configured to process the text;

- a Database of Extracted Information;

- a Components Recognition Module configured to identify all system components described in the examined text, in case of a patent the components being the components of the invention;

- a Components Classification Module configured to order and classify the identified components;

- an Interactions Analysis Module configured to identify all functional links existing between the recognized components of the examined system, the identified links being configured to be stored in the Database of Extracted Information;

- a Product Identification Sub-Module configured to identify all secondary products and among these a main product of the examined system;

a Post Processing Module configured to supply the contents of the Database of Extracted Information to the user, the contents being organized in different forms as a function of a scope of the analysis.

Claim 47 (New): A system according to Claim 46, further comprising a semantic processor configured to perform identification of all system components described in the examined text, the semantic processor configured to extract from each sentence a triad Tool-Field-Artifact TFA and comprising:

means for filtering the triads Tool-Field-Artifact TFA containing a Field belonging to a set of the Stop Words and Analog Words Database that contains a list of verbs not significant from a functional point of view;

means for collecting the Tools and the Artifacts that have survived filtering in the means for filtering;

optionally, means for adding a further set of candidate components by using commonly available techniques to identify words representative of the content of a text;

among all candidate components, the components being Tool and Artifacts that survived the filtering, means for eliminating noun repetitions also taking into account the synonyms list of a set of the Stop Words and Analog Words Database containing a table of synonyms of candidate components, at different detail levels;

means for assuming all remaining components as the components of the examined system.

Claim 48 (New): A system according to Claim 46, further comprising a semantic processor configured to identify functional links existing between the recognized components



of the examined system, the semantic processor configured to extract from each sentence a triad Tool-Field-Artifact TFA and comprising:

means for, if both Tool and Artifact are system components and the Field is not belonging to a set of the Stop Words and Analog Words Database that contains a list of verbs not significant from a functional point of view, assuming the triad TFA as a basic functional block of the system;

means for, if just one among the Tool and the Artifact is a system component, but the Field is a verb of the functionalities requested in a given field of application, assuming the missing Tool/Artifact as an External Component of the system and assuming the complete triad as a basic functional block of the system;

means for, if a pair Field-Artifact among those extracted by the semantic processor belongs to a set of the Stop Words and Analog Words Database that contains a table of the pairs Field-Artifact, their translations in a functional verb and one or more prepositions typically associated to that locution, used to search the Artifact automatically, assuming the subject of the verb as the Tool of the triad and translating the pair Field-Artifact according to the table of the set of the Stop Words and Analog Words Database in a functional Field.

Claim 49 (New): A system according to Claim 46, further comprising means for transferring attributes as an assembly, part, or portion identifying the role of a component in the assembly described in the text, through data exchange formats.

Claim 50 (New): A system according to Claim 46, further comprising means for linking attributes as an assembly, part, or portion identifying a role of a component in the assembly described in the text to a geometric database of a CAD system as a direct link to a

Feature Tree of a Part model and/or to an Assembly Tree of an Assembly model, thereby integrating a conceptual model of a mechanical system to its embodiment.

Claim 51 (New): A system according to Claim 46, further comprising means for storing in the Database of Extracted Information all identified triads, and a position in the examined text of the sentence from where such a triad has been extracted.

Claim 52 (New): A system according to Claim 46, further comprising means for evaluating a position in the examined text of the sentence from where such a triad has been extracted, just numbering with a sequential order all sentences of the examined text, distinguishing a sentence from another based on a predetermined character or an ASCII character Carriage Return.

Claim 53 (New): A post Processing Module of a system according to Claim 46, wherein a Text Content Module represents:

- each identified component of the system with its reference number and a representative name defined by the Components Recognition Module;
- each identified component or subject external to the system;
- a main product for internal/external components;
- a detail level hierarchy determined by the Classification Module;
- a functional interactions between the identified components according to results of the Interactions Analysis Module.

Claim 54 (New): A text Content Module of a system according to Claim 53, configured to represent:

each identified component of the system by a rectangle labelled with its reference number and a representative name defined by the Components Recognition Module;

each identified component or subject external to the system represented by a hexagon labelled with string EXT;

a sequential number and the representative name defined by the Components Recognition Module;

a main product by an ellipse labelled with a same criteria for internal/external components;

a detail level hierarchy determined by the Classification Module represented nesting the components at a deeper detail level inside the components at a more abstract level;

a functional interactions between the identified components being represented with arrows pointing from the Tool to the Artifact, labelled with the Field, according to the results of the Interactions Analysis Module.

Claim 55 (New): A post Processing Module of a system according to Claim 53, wherein the Text Content Module configured to represent:

a list of components with their detail level DL and a corresponding supersystem;

a list of secondary products as pairs Field-Artifact with their main product probability value MPPV;

a list of partial probability values evaluated using the Products Identification Sub-Module;

a list of functional interactions between the identified components.

Claim 56 (New): A post Processing Module of a system according to Claim 53, wherein a Text Comparison Module is configured to compare between two or more systems descriptions according to following parameters:

comparison between a system diameter, that is a number of detail levels identified by the Components Classification Module;

comparison between a number of internal components of the examined systems, both taking into account the whole list of identified components and each detail level;

if the analysis of the Mechanical Embodiment Analysis Sub-Module has been performed, comparison between a number of an assembly, part, and portion of the examined systems;

comparison between a number of interactions identified by the Interactions Analysis Module, and, if two or more Fields are associated to the same pair Tool/Artifact, checking to eliminate synonymous Fields taking into account the set of the Stop Words and Analog Words Database containing a table of synonyms of functional verbs representing a Field;

comparison between a number of interactions, counted as in the comparison between a number of interactions, acting on components at a same Detail Level, highlighting whether these components belong to the same supersystem or not;

comparison between a number of interactions, counted as in the comparison between a number of interactions, acting on components at a different Detail Level, highlighting whether these components are one subsystem of the other or not, taking also into account a difference between their detail levels;

comparison between a number and lengths of branches being present in the functional diagram of the examined systems evaluated starting from a Main Product of the systems themselves;

comparison of components at a same rank, the rank of a component being defined as a minimum distance, in terms of number of interactions, that links the Main Product of the system with the component itself;

analysis of a detail level run along the description of the examined system, the Interactions Analysis Module storing a position in the text of each identified interaction TFA, the detail level of the Tool and the Artifact in a sentence being assumed as the detail level of the description, hence being it possible to analyse the detail level run in the examined test and to compare such a run in different texts.

Claim 57 (New): A post Processing Module of a system according to Claim 53, configured to perform an analysis of peaks of the Detail Level along a description of a system allowing the identification of a core and secondary peculiarities of the system itself.

Claim 58 (New): A post Processing Module of a system according to Claim 53, comprising a Database of Functional Usage of Components in Different Systems that is configured to store all functional interactions associated to homonymous components in all examined texts, recording a reference to a source text and the role of the component in the triad TFA.

Claim 59 (New): A post Processing Module of a system according to Claim 53, comprising a Database of Components Capable of Performing a Given Function configured to store:

all Tools associated with homonymous Fields found in all examined texts, recording a reference to a source text and a complete triad TFA;

all Tools associated with homonymous pairs Fields-Artifacts found in all examined texts, recording the reference to the source text and the complete triad TFA.

Claim 60 (New): A stop Words and Analog Words Database of a system according to Claim 46, constituted by eight sets of words, the words being able to be automatically customisable by a user through:

- supplying by the user supplies to the system a set of typical documents of the field of application the user is interested in;

- performing a semantic analysis through a semantic processor and a table of Tools and Artifacts and storing their occurrence;

- by comparing the table defined in the previous step and the complete Database, automatically customising the Filters and Synonyms lists, to create typical subsets of the Database labelled with a field of application of the processed documents.

Claim 61 (New): A stop Words and Analog Words Database of a system according to Claim 60, wherein the Database is constituted by sets of:

- a list of stop keywords for words adjacent to numeric characters during the Components Recognition task;

- a table of synonyms of candidate components, at different detail levels;

- a list of typical Fields of the functionalities requested in a given field of application;

- a table of descriptive verbs taking into account all forms that these verbs can assume, also due to conjugation irregularities;

- a list of terms describing a portion of a component;

- a list of verbs not significant from a functional point of view;

a table of the pairs Field-Artifact, their translations in a functional verb and one or more prepositions typically associated to that locution, used to search the Artifact automatically;

a table of synonyms of functional verbs representing a Field.

Claim 62 (New): A system according to Claim 46, configured to customize systems of:

Components Recognition Module, Component Classification Module and Interactions Analysis Module activities are configured to be followed step by step by a user, the user being able to compare extracted information with its source sentence, or such activities being able to be performed automatically even if with a lower reliability;

a list of components are able to be specified by the user to focus the Interactions Analysis on, in order to extract just the corresponding functional sub-diagrams;

the search for Secondary Products and/or the Main product of the examined systems is able to be limited to the components external to those systems.